REMARKS

In filing the Request for Continued Examination, Claims 1 and 11 were amended to state that that the steam cycle of the present invention is operating with a high-energy state temperature of approximately of 550°C. However, while an operating temperature of approximately 550°C is typical for steam cycles operating with water, and particularly steam cycles operating with only water as a working medium, and while embodiments of the present invention work well at operating temperatures of approximately 550°C, the present invention will actually operate at temperatures as low as 400°C. Therefore, Claims 1 and 11 have now been amended to state that the invention operates with the water based mixture in a steam cycle in a high-energy state at an operating temperature above 400°C. Organic Rankine cycles generally operate with the operating medium in high energy state at temperatures well below 400°C.

Yogev et al. operates at temperatures below 400°C. In the solar version of Yogev et al., Yogev et al. say (Col. 2, lines 62-66): "The working fluid circulates in the primary solar collector. Part of it is vaporized by flashing to obtain high pressure and high temperature vapor for the turbine of the power plant in the range of 300-400 deg. C. and 3-6 atmosphere pressure." In describing the specifics of the solar version, Yogev et al. say (Col. 4, lines 59-65): "Liquid tetralin contained in solar collector 12 is typically heated to about 302 deg. C. and a pressure of about 5.8 bar by the collector. Flash chamber 16 will typically have a pressure of about 5 bar producing a liquid in sump 20 at about 297 deg. C. Tetralin vapor entering high temperature turbine 24 will be at about 290 deg. C. with a pressure of about 5 bar." Thus, the high temperature for the working fluid in the solar application is around 300°C. In addition, Yogev et al. teach (Col. 5, lines 59-60) that their working fluid tetralin will begin to decompose around 400°C. Thus, Yogev et al.'s fluid tetralin would not be satisfactory for systems operating at above 400°C.

Yogev et al., in a general discussion of nuclear power plants and the organic working fluids used by Yogev et al, say (Col. 3, lines 3-9): The liquids belonging to this group [liquids used by Yogev et al.] are known to be stable under conditions of radiation within nuclear power

plants and are therefore suitable as cooling liquids in nuclear reactors operating at temperatures under 400°C. The same liquids can be used in nuclear power plants both as cooling liquids and/or working fluids for the turbines." In describing the specifics of the nuclear version, Yogev et al. say (Col. 7, lines 3-6): "Heat source 62 in high pressure portion 61 is a nuclear reactor which produces naphthalene vapor at the temperature and pressure indicated above." The temperature and pressure indicated above is indicated at Col. 6, lines 61-62, as "Saturated naphthalene vapor at 300 deg. C. has a pressure of about 5 bar." Thus, the high temperature for the working fluid in the nuclear application is around 300°C.

Nothing in Yogev et al. teach or suggest temperatures for the working fluid above 400°C, and Yogev et al. specifically limit the temperature of the working fluid in their claim to "not exceeding 400°C."

McEwen does not appear to specifically set forth an operating temperature range for his disclosed fluids, however, McEwen does say, Col. 2, lines 14-16, that: "Still another object of the present invention is to provide a Rankine cycle power system capable of utilizing low temperature waste heat as a heat source" and, Col. 3, lines 3-6, "the fluids of the present invention are particularly advantageous for recovering and converting heat energy to mechanical energy from relatively low level heat sources." Table II in the description presents Rankine cycle efficiencies calculated on expansion of from 500°F to 100°F, which corresponds to from 260°C to 38°C. This, then, would be McEwen's temperature range suggested to a person skilled in the art, i.e., a range below 300°C. Nothing in McEwen indicates or suggests use of temperatures of above 400°C.

It should also be pointed out that Table II in McEwen presents the Rankine cycle efficiencies for the particular fluids shown, not for combinations of these fluids. Thus, the listing for water lists the Rankine cycle efficiency for water expanding from 500°F to 100°F. This is then used in Col. 5, lines 14-17, for a comparison with the Rankine cycle efficiencies of the other listed fluids, with McEwen saying that "Although water has a somewhat higher efficiency than the cited organic fluids, this gain is more than offset by the disadvantages caused by the deficient entropy characteristics of steam." This then teaches the person skilled in the art that water should not be used. While the Examiner argues in his Final Action that "McEwen clearly discloses the mixture of the fluids can be used", applicant disagrees that the mixtures McEwen teaches are

mixtures with water, let alone water based mixtures. McEwen says, Col. 5, lines 19-24, that "In addition to those sulfur-free, non-halogenated organic compounds meeting the entropy requirements established herein, it is to be understood that the present invention also includes mixtures or blends of one or more of said compounds wherein the entropy change of the mixture does not exceed 0.10 B.t.u. per pound per ° R. at the conditions established (emphasis added)." This, coming right after McEwen has compared the efficiency of water with the McEwen sulfur-free, non-halogenated organic components, and teaching that the higher efficiency of water is offset by the disadvantages of water, does not suggest a mixture of one of the McEwen sulfur-free, non-halogenated organic compounds with water. It would refer to mixtures or blends of sulfur-free, non-halogenated organic compounds. Water is not a sulfur-free, non-halogenated organic compound. Thus, McEwen does not teach or suggest a water based working fluid.

Zimron et al. does not teach Rankine cycle power system working fluids, but teaches systems and methods for cooling seals, such as seals used in organic Rankine cycle power plants. In that connection, Zimron et al. teaches that the temperatures of the working fluid in an organic Rankine cycle power plant condenser are typically about 350°F or 177°C (Col. 3, lines 51-56), and that the typical temperature of the working fluid vapor leaking into the seal of the turbine of such systems (working fluid in high energy state) is about 550°F or about 288°C (Col. 3, lines 59-61). These temperatures are all below 300°C, and well below the "above 400°C" claimed.

Tincher et al. deals with hydraulic fluids or metalworking lubricants. There is no indication or teaching that Tincher et al.'s hydraulic fluids or metalworking lubricants would work as or could be used as working fluids for a Rankine cycle power system. Thus, while Tincher et al. disclose water based hydraulic fluids and metalworking lubricants, a person skilled in the art of Rankine cycle power plants would have no reason to substitute a hydraulic fluid or metalworking lubricant as disclosed in Tincher et al. for a known working fluid, such as water, in a Rankine cycle power plant. Further, there is no suggestion that any of the Tincher et al. hydraulic fluids or metalworking lubricants would work as a Rankin cycle power system working fluid, or that it would work as such in energized states above 400°C and that it could be cycled between high energy states and condensed states.

It is submitted that Claims 1 and 11 as now amended are allowable. None of the cited prior art teaches a steam cycle power system using a water based working medium that is a

mixture of water and at least one heterocyclic compound and which operates with the working medium at a temperature above 400°C when in its high energy state.

The Commissioner is hereby authorized to charge any additional fee or to credit any overpayment in connection with this Amendment to Deposit Account No. 20-0100.

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Respectfully submitted,

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